



## Title of Article

# Formulation and evaluation of polyherbal handwash

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### Abstract

Pharmaceutical applications and cosmetics plants are frequently used in the medical practice of new medicinal products. There are several herbal cosmetics on the market that are used to improve a person's appearance. Because they have little or no negative effects, herbal cosmetics are frequently utilized and produced for daily use. The goal of the current work is to create a polyherbal hand wash formulation that will clean, smooth, and remove bacteria and pathogens from hands. In the current study, methanolic extracts of the leaves of *Glycyrrhiza glabra*, *Piper nigrum*, and *Lantana camara* (Tantani) are combined to create a polyherbal hand wash that is evaluated (Liquorice). Two formulations of hand wash were prepared and formulations were evaluated for physical properties like appearance, pH, odor and stability were also checked. The F2 results revealed that the formulations were stable and were able to clean the hands with creating sufficient amount of foam.

**Key Words** – Polyherbal, Hand Wash, Tantani, Black pepper, Liquorice, Skin

## **Introduction**

One of the most efficient methods for preventing the transmission of many resistant germs and lowering diseases linked to medical care is hand washing. Although important reasons for noncompliance have been identified and corrective measures have been suggested, compliance with hand hygiene recommendations is still poor. Patients, family members, and all healthcare professionals should wash their hands frequently. The primary goal of hand hygiene in medical settings is to prevent the spread of pathogens between patients and staff members. According to data on hand washing, 80% of contagious diseases are transmitted through contact. Before preparing food, just 20% of individuals wash their hands. After using the restroom, less than 50% of males and less than 75% of women wash their hands. After washing their hands, only 20% of people dry them.

The literature review shows, antibacterial activity of various varieties of *L. camara* plant leaves and flowers has been documented. Four different varieties of *L. camara*'s leaves and flowers were extracted using three different solvents, and the results showed significant antibacterial activity against *E. coli*, *Bacillus subtilis*, and *P. aeruginosa* but weak antibacterial activity against *Staphylococcus aureus*. [1] By using the disc diffusion method and the broth microdilution method, methanolic extracts of various parts of *L. camara* were tested for antimicrobial activity against 10 bacteria and 5 fungi. The most effective antimicrobial properties of *L. camara*'s leaf extract were against the Gram positive *Bacillus cereus* and the Gram negative *Salmonella typhi*. [2] White and brown rot fungi were used to test the ethanol and hot water extract of *L. camara*'s antifungal effectiveness. Although both extracts were highly effective against white and brown rot fungus, ethanol extract had the most potential at very low concentrations.

Nowadays, the majority of people choose herbal cosmetics over chemical or synthetic products since, when used often, the chemical compounds used in formulations can be poisonous or detrimental to both humans and animals. Natural cosmetics have fewer or no adverse effects than synthetic ones and are free of dangerous synthetic chemicals. [3]

### **Advantages of herbal cosmetics over synthetic**

- 1. Safe to use-** Natural beauty products are safe to use when compared to other cosmetics. They have been dermatological tested and shown to be hypoallergenic and safe for usage anytime, anywhere. People don't have to worry about developing skin rashes or itching because they are made of natural substances.
- 2. Skin-friendly** - Natural cosmetics work well on all skin types. No matter your skin tone, whether you are fair or dark, you may discover natural cosmetics like foundation, eye shadow, and lipstick that work for you. They can be used by women with sensitive and oily skin without compromising their skin conditions.
- 3. Variety of selection** - Despite being a relatively new category in the cosmetics industry, natural cosmetics already provide a wide range of cosmetics for all make-up enthusiasts to choose from. There are several naturally formulated cream lotion soap, shampoos, conditioners, and other products available. Additionally, one can get locally produced natural cosmetics or those created by well-known international designers. A wide range of herbal extracts are available.
- 4. Is within a reasonable price range** - Natural cosmetics are not very pricey. In some cases, these goods are less expensive than synthetic ones. During sales, they are offered at a reduced cost and are sold for less money. Due to

their accessibility, affordability, and relative safety, traditional herbal remedies are being encouraged and recommended by the World Health Organization in natural health care programmes.

**5. No side effects** - Synthetic cosmetics can irritate your skin and result in breakouts. They may cause pore blockage and result in dry or oily skin. One should not worry about these things when using natural cosmetics. One can take them anytime, anywhere because the natural components ensure there are no negative effects. For instance, herbal cosmetics are free of parabens, the most common preservative used in cosmetics and a skin irritant.

### Components of polyherbal handwash

- **Tantani Leaves (*lantana camara*)** –

Uses - Studies conducted in India have found that *Lantana* leaves can display antimicrobial, fungicidal and insecticidal properties. Camara has also been used in traditional herbal medicine for treating varieties of ailments including cancer, skin itches, leprosy, measles etc. It is found frequently in east and southern Africa. *L. Camara* has also spread across the area of Africa, southern Europe, such as Spain and Portugal and the middle east, India, tropical Asia, Australia, New Zealand and the US as well as many Atlantic, Pacific and India ocean island.

Toxicity - *Lantana camara* is known to be toxic to livestock such as cattle, sheep, horses, dogs and goats. The active substances causing toxicity in grazing animals are pentacyclic triterpenoids, which result in liver damage and photosensitivity. *L. camara* also excretes allelopathic chemicals, which reduce the growth of surrounding plants by inhibiting germination and root elongation.

Other studies have found evidence which suggests that *L. camara* fruit poses no risk to humans when eaten, and is in fact edible when ripe.



- **Black Pepper Seeds (*Piper Nigrum*)** –

Uses - Pepper's antibacterial and anti-inflammatory properties help cure skin infections and acne. It exfoliates dead skin and stimulates blood circulation causing more oxygen to flow. It also triggers the secretion of hydrochloric acid that not only helps digest food but also helps break up and expel gas trapped in the intestine.

Black pepper is a plant of humid tropics requiring high rainfall and humidity. The hot and humid climate of sub mountainous tracts of Western Ghats is ideal for its cultivation. It grows successfully between 20° North and South latitude, and from sea level up to 1500 m above sea level. The crop tolerates temperatures between 10° and 40°C. The ideal temperature is 23 -32°C with an average of 28°C.

Optimum soil temperature for root growth is 26-28°C. A well distributed annual rainfall of 125-200 cm is considered ideal for black pepper. Black pepper can be grown in a wide range of soils with a pH of 5.5 to 6.5, though in its natural habitat it thrives well in red laterite soils.



- **Liquorice (*Glycyrrhiza glabra*) –**

Uses – The essential oils of liquorice inhibit the growth of *Aspergillus flavus*. Liquorice also found in wide variety of candies or sweets. Liquorice helps to reverse hyper pigmentation. Liquorice can speed up the healing process by inhibiting production of melanin. It is a widely used herbal medicine.

- **Peppermint oil (*Mentha Piperita*) –**

Uses – Peppermint oil and leaves have a cooling effect when used topically for muscle pain, nerve pain and relief from itching or as a fragrance.

- **Glycerin–**

Uses - In food and beverages, glycerin serves as a humectants, solvent, and sweetener, and may help preserve foods and as a thickening agent in liqueurs. Glycerin is mildly antimicrobial and antiviral and is an FDA approved treatment for wounds. It is also used in medical, pharmaceutical and personal care preparations, often as a means of improving smoothness, providing lubrication, and as a humectants.

- **Sodium Laureth Sulphate –**

Uses - Sodium lauryl sulfate (SLS), also known as sodium lauryl sulfate or sodium dodecyl sulfate, is an anionic surfactant commonly used as an emulsifying cleaning agent in household cleaning products (laundry detergents, spray cleaners, and dishwasher detergents).

- **Methyl Paraben –**

Uses - Methyl paraben is an anti-fungal agent often used in a variety of cosmetics and personal care products. It is also used as food preservative. Methyl paraben is commonly used as a fungicide in *Drosophila* food media at 0.1%.

- **Sodium Chloride –**

Uses - The addition of sodium chloride forms fatty-acid salts in a soap formulation. Sodium chloride when used in soap can have many medicinal and healing benefits as it can help treat some skin conditions and help exfoliate.



Licorice powder used topically to the afflicted region naturally reduces hyperpigmentation, leaving your skin feeling smooth and looking more youthful. It has a strong odor and is slightly yellow in color. It is high in calcium, glycyrrhizinic acid, antioxidants, protein, and antibiotics. Additionally, black pepper has antibacterial, antioxidant, immune-stimulating, and fever-lowering effects. Excellent antioxidant benefits of black pepper benefit your health in a variety of ways. One South African study found that the larvicidal properties of piperine in black pepper aid to reduce infection and the spread of disease.

### **Hand hygiene -**

Is the technique of preventing the spread of diseases by washing hands with soap and water or applying alcohol-based hand rubs as needed. The most frequent means of HAI transmission from patient to patient and within the healthcare setting are health care employees (Allegranzi 2009).

Cross-contamination and the spread of microorganisms from HCWs' hands to patients were largely responsible for the infection. Improved hand cleanliness has consistently been linked to decreased nosocomial infections and cross-contamination of multi-resistant illnesses in hospitals, according to numerous research (Mathai *et.al.*, 2011). The majority of nosocomial illnesses are believed to be spread by HCWs' hands. It is crucial to evaluate HCWs' knowledge, attitudes, and hand-washing practices (Khaled *et.al.*, 2006) All patients who are admitted to a hospital face a very real and dangerous risk from hospital acquired infections. [4]

HCWs can easily spread pathogens on their hands, however good hand hygiene habits significantly lessen this risk. Thus, it is crucial to conduct research to evaluate HCWs' hand hygiene habits (Creedon, 2005). The primary source of cross-infection in hospitals is the spread of pathogens from HCWs' hands, which can be avoided by frequent hand washing. Finding indicators of hand washing non-compliance during routine patient care is crucial (Hugonnet 2002).

In the majority of intensive care units, healthcare-associated infections continue to be a serious issue. The easiest and most reliable way to prevent them is with good hand hygiene. Therefore, it is crucial to evaluate the stated hand hygiene practices, keep an eye out for gaps, and plan corrective action to lower HAIs. [5]

### **Materials and methods**

#### **Plant material collection:**

In the month of May 2022, *Lantana Camara* plant material were collected from gardens near residential areas in the Nashik region of India. Licorice and black pepper were bought in the neighborhood market. The sample had a thorough water wash before being partially sun- and shade-dried for three to four days. To create fine powder, the dried plant material was then ground and sieved. The substance was then extracted using the appropriate solvent.

**Materials of hand wash formulation –**

| Sr.No. | Ingredients                | Categories                          |
|--------|----------------------------|-------------------------------------|
| 1      | Tantani Leaves ( Extract ) | Antimicrobial agent                 |
| 2      | Black Pepper (Extract )    | Antibacterial agent                 |
| 3      | Liquorice ( Extract)       | Antifungal , Demulcent              |
| 4      | Glycerin                   | Moisturizing and<br>smoothing agent |
| 5      | SLS                        | Surfactant                          |
| 6      | Methyl Paraben             | Antifungal , Preservative           |
| 7      | Peppermint Oil             | Essential Oil                       |
| 8      | Sodium Chloride            | Viscosity enhancer                  |
| 9      | Water                      | Diluents                            |
| 10     | Color                      | Coloring agent                      |

**Formulation of Handwash –****Preparation of herbal extract –**

Methanolic extract of each plant material was made by extracting 5 g of powdered material for 48 hours with a 20 ml solution of methanol. To obtain a particle-free extract, the material was filtered with whatman filter paper.

**Formulation preparation for hand wash -**

The hand wash was prepared by adding methanolic extracts of each plant material in glycerin and distilled water. Finally, sodium laurel sulphate, methyl paraben and flavoring agents were added for preparation of hand wash. The solution was made homogeneous under room temperature and stored for further analysis.

| Sr. No. | Ingredients              | Quantity [F1] | Quantity [F2] |
|---------|--------------------------|---------------|---------------|
| 1       | Tantani Leaves (Extract) | 15ml          | 5ml           |
| 2       | Black pepper (Extract)   | 15ml          | 5ml           |
| 3       | Liquorice ( Extract)     | 15ml          | 5ml           |
| 4       | Glycerin                 | 30ml          | 35ml          |

|    |                 |       |       |
|----|-----------------|-------|-------|
| 5  | SLS             | 20ml  | 40ml  |
| 6  | Methyl Paraben  | 0.3gm | 0.3gm |
| 7  | Sodium Chloride | 1gm   | 1gm   |
| 8  | Peppermint Oil  | 5ml   | 5ml   |
| 9  | Coloring agent  | 0.2gm | 0.2gm |
| 10 | Water           | QS    | QS    |

To prepare herbal hand wash first prepare the herbal extracts. Prepare herbal extracts by adding 5 gm of fine powder of each ingredient in 20 ml of methanol solution for 48 hours. Then filter the content through filter paper to get particle free extracts. Weigh all the remaining ingredients as given in the formula. Take 40 gm of Sodium Laureth Sulphate and add 5ml of tantani extract, 5ml of Liquorice extract and 5ml of black pepper extract in it and stir well. Take 0.3 gm of Methyl Paraben and add it into the solution of extracts and sodium laureth sulphate. Mix the solution well so that small aggregations of methyl paraben should not appearance. Finally add 1 gram of sodium chloride as thickening agent to the formulation and 5 ml of peppermint oil for the required essence and stir the formulation well for 2-3 Minutes for good results.

### Evaluation of formulated Hand Wash

By sensory and visual inspection, the color and odor of the sample were evaluated and compared to the commercial hand wash. The following criteria were used in the evaluations of the hand wash:



- **Color** - A visual inspection was done to determine the color of the prepared formulation.
- **Odor** - The hand wash's odor was evaluated by applying it to hands and inhaling the formulation.
- **Appearance and homogeneity** - The herbal hand soap had a uniform appearance and was translucent and yellow in hue.
- **pH** - A pH paper was used to measure the pH of hand wash. The pH was determined after dissolving 5 ml of the formulation in 25 ml of pure water. Hand wash has a pH of 6 to 7.

- **Stability research** - For 10 days at a temperature of 37°C, the prepared hand wash underwent a stability study. No phase separation or color change in the hand wash formulation was seen during the stability experiments. The condition was steady during hand washing.
- **Foaming test** - For the foaming test, 25 milliliters of the 1% soap solution were placed in a 100 milliliter graduated measuring cylinder, covered with a hand, and shaken ten times. For four minutes, the volume of foam was measured at 1-minute intervals. For five minutes, foam retention should remain steady.
- **Foam height test** - One gram of Polyherbal Hand Wash Gel sample was obtained and dissolved in 50 ml of distilled water for the foam height test. Transfer of dispersion into measuring cylinder. Water was added to the volume to make it 100ml. This solution is taken in ten test tubes in a sequence of portions of 1, 2, 3 and 10ml, with the remaining volume being filled with water to a final volume of 10ml. The test tubes were then shaken for a further 15 seconds. The test tube is then given permission to stand for 5 minutes. And the foam's height was determined.
- **Fragrance test** -

The fragrance test evaluated a scent's acceptability based on individual observation. When five persons were asked whether a fragrance was acceptable, the results were as follows:

- 1 The hand wash has a very impressive fragrance.
- 2 The fragrance of hand wash is comparable to that of commercial products.
- 3 The scent of hand wash is fairly potent.
- 4 The scent of hand wash is inferior to others that are offered.
- 5 The scent of hand soap is not unpleasant, it is fine.

- **Skin irritation test** - The Polyherbal Hand Wash Gel was applied to the skin and left on for 30 minutes. After washing, the skin was checked for itching, rashes, or redness using both sensory and visual methods by Draize Approach (16).
- **Dirt dispersion test** - A test tube containing 10 ml of distilled water and 1 ml of Polyherbal Hand Wash Gel was used for the dirt dispersion experiment. After adding a drop of Indian ink, the test tube was stoppered, then shaken. Estimates of the ink content of the foam ranged from none to mild, moderate, or heavy.

## Result -

To ensure that produced hand wash is superior, the following assessment criteria were used:

### 1. Organoleptic evaluation –

The hand wash was assessed for the organoleptic parameters listed in the following table. Formulation-1 was a greenish-brown color, while Formulation 2 was a yellow-brown color. Both formulations odours were mild and well-tolerated, which is ideal for cosmetic products.



| Parameters                 | Results                            |                                   |
|----------------------------|------------------------------------|-----------------------------------|
|                            | F1                                 | F2                                |
| Appearance and homogeneity | Translucent                        | Translucent                       |
| Color                      | Greenish Brown                     | Yellowish Brown                   |
| Odor                       | Peppermint like (Good acceptable ) | Peppermint like (Good acceptable) |
| Texture                    | Smooth                             | Smooth                            |

## 2. Physicochemical analysis –

The hand wash formulation was made, and physical characteristics like pH, stability, foaming test, foam height, skin irritation test, and dirt dispersion test were assessed. The table below contains the evaluation test results

### a) Determination of pH –

| Sr. No. | Days         | Formulation Batches |       |
|---------|--------------|---------------------|-------|
|         |              | F1                  | F2    |
| 1       | Initial days | 6 – 7               | 6 – 7 |
| 2       | 7 days       | 6 – 7               | 6 – 7 |

From the above table, it can be seen that both formulations' pH levels were found to be neutral both at the beginning and after seven days.

### b) Determination of stability – (F2)

| Sr.No. | Evaluation          | 15 Days     | 30Days      | 45Days      | 60 Days     | 75 Days     | 90 Days     |
|--------|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1      | Clarity of Solution | Clear       | Clear       | Clear       | Clear       | Clear       | Clear       |
| 2      | Appearance          | Translucent | Translucent | Translucent | Translucent | Translucent | Translucent |
| 3      | pH                  | 6.59        | 6.47        | 6.21        | 6.42        | 6.34        | 6.16        |

Phase separation was observed in formulation no 1 and hence it was considered as unstable. Formulation no 2 was good in appearance and also phase separation was not observed in it as it was stable. Hence formulation 2 passed the stability testing.

**c) Foam height test –**

Foam height test of the formulation was performed by the procedure as given in the evaluation test with their help of 10 test tubes and result of each test tube was noted as follows-

| Test tube no. | Sample: Water | Foam height |
|---------------|---------------|-------------|
| 1             | 1 : 9         | 0.9         |
| 2             | 2 : 8         | 1.1         |
| 3             | 3 : 7         | 1.3         |
| 4             | 4 : 6         | 1.6         |
| 5             | 5 : 5         | 1.9         |
| 6             | 6 : 4         | 2.4         |
| 7             | 7 : 3         | 2.7         |
| 8             | 8 : 2         | 2.8         |
| 9             | 9 : 1         | 3.4         |
| 10            | 10 : 0        | 3.7         |

**d) Determination of skin irritation test –**

| Sr. No. | Parameter       | Result        |               |
|---------|-----------------|---------------|---------------|
|         |                 | F1            | F2            |
| 1       | Skin irritation | No irritation | No irritation |

Both formulations were found to be non irritant to skin. The formulations are safe to use on skin.

**d) Dirt dispersion test –**

| Sr. No. | Parameter       | Result |       |
|---------|-----------------|--------|-------|
|         |                 | F1     | F2    |
| 1       | Dirt dispersion | Light  | Light |

The formulation was assessed using the provided assessment tests, including those for color, odor, appearance, pH, stability, dirt dispersion, skin irritability, foaming, and foam height. All test findings were accurately recorded and mentioned here. Comparing the evaluation tests to the marketed preparations, all of them were judged to be acceptable

## **Conclusion**

According to studies on people's health needs, herbal formulations are preferred over commonly used medicines with chemical constituents. Herbal elements make it possible to create cosmetics with the fewest possible side effects and no adverse effects. Herbal ingredients are thought to be a dependable and effective way to improve skin appearance. They also work well against bacterial and fungal infections. The formulation of a hand wash using *Lantana camara* (Tantani), *Piper nigrum* (Black pepper), and *Glycyrriza glabra* (Liquorice) herbal extracts is thus a very good attempt in the current work. The obtained formulation was found to be physico-chemically stable. An organoleptic analysis revealed that hand wash has good color and smell. Formulation was stable on given conditions.

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